

## Reclining Back with Anti-tip Protection for Wheelchairs

### Background of the Invention

#### 5 Field of the Invention

This invention pertains generally to the field of seats and chairs with reclining backs and in particular to reclining backs with anti tip protection for wheelchairs.

#### 10 State of the Prior Art

Wheelchairs have been equipped with reclining backs in the past, and it is known to provide restraints against rearward tipping of the chair. The previous reclining backs and anti-tipping restraints were not operable by the wheelchair occupant. What is needed is a  
15 reclining backrest operable by a user seated in the wheelchair with anti tipping restraints automatically deployed in response to movement of the backrest.

### Summary of the Invention

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A wheelchair having a wheelchair frame including a seat supported on the frame has a backrest which is pivotable on the frame between an upright position and a reclined position. A pair of rear wheels are journaled to the frame for rotation about a rear wheel axis, and a pair of anti-tip legs are attached to the frame and movable between a retracted  
25 position and an extended position for contacting a ground surface behind the rear wheel axis in response to pivoting movement of the backrest.

The wheelchair frame may have a pair of armrests and a detent plate is provided along each of the armrests, each detent plate having a slot including a plurality of detent  
30 notches open to the slot. A pair of left and right detent arms can be attached to the backrest each detent arm having a forward end captive for displacement along the slot and engageable in any one of the detent notches for detaining the backrest at one or more

positions intermediate to the upright position and the reclined position. Preferably, a handgrip is provided on the forward end of each detent arm.

5 The backrest, the legs and the detent arms may be spring biased towards the upright position, the retracted position and a forwardmost position, respectively. For example, a spring can be connected for urging the detent arms to a forwardmost position corresponding to an upright position of the backrest, and the anti-tip legs can be spring loaded towards their retracted position such that the spring force acting on the detent arms and on the anti tip legs tends to return the backrest to its upright position when the detent arms are released from  
10 the detent notches.

In a presently preferred form of the invention a pair of linkage arms are pivoted to the wheelchair frame, the backrest being supported on the linkage arms for pivotal movement therewith relative to the wheelchair frame, and the linkage arms are connected for moving  
15 the legs between the retracted position and extended position responsive to pivoting movement of the backrest. A mounting plate may be fastened to each side of the wheelchair frame, and a linkage arm pivoted to each mounting plate.

In a particular embodiment of the invention the anti tip legs are mounted for generally  
20 vertical movement on the wheelchair frame and the backrest has linkage arms connected for urging the legs downwardly into ground contacting position responsive to rearward pivoting of the backrest. The legs may be vertically slidable through leg holders fastened to the wheelchair frame. The leg holders may be removably fastened to the wheelchair frame on a pair of bottom tubes of the wheelchair frame terminating in rear ends behind the rear wheel  
25 axis. The leg holders may be in the form of holder sleeves fitted to the rear ends of the bottom tubes provided with sleeve fasteners for releaseably securing the holder sleeves to the rear ends.

The reclining backrest can removably attached to the wheelchair frame to allow  
30 folding of the wheelchair frame or replacement of the reclining backrest with a non-reclining backrest.



wheelchair frame 12 which generally consists of a tubular framework including a pair of front legs 14, a pair of rear legs 16, left and right side arm rests 15 supported on side arm tubes 18 connecting the top ends of the front and rear legs 14, 16, a pair of seat carrier tubes 20 on each side of the wheelchair frame 12 connecting the front and rear legs 14, 16 at a mid  
5 height level, and a bottom tube 22 which connects the lower ends of each front leg 14 and the corresponding rear leg 16. The wheelchair also has a pair of front caster wheels 24 mounted to the lower ends of the front legs 14, and a pair of larger rear wheels 26 journaled to the wheel chair frame 12 for rotation about a rear wheel axis 28. A wheelchair seat 30 is supported between the left and right seat supports 20.

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A reclining backrest generally designated by numeral 30 has a seat back 32 which may have a padded or cushioned front 34 and is fastened to a frame consisting of left and right posts 36 and a cross rail 38 which extends across the lower end of the seat back 32, as best seen in Figure 3. The upper ends of the vertical posts 36 are connected by a handle  
15 bar 42.

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The backrest 32 is supported on linkage arms 40, in a manner which will be explained in greater detail below, and which in turn are pivoted to mounting plates 42 fastened to the rear legs 16. Each linkage arm 40 has a short upright arm portion 46 into which is cut a  
20 receiving slot 48. One linkage arm 40 is mounted on each of the left and right rear legs 16 of the arm chair 12, and while Figure 3 shows only the left side linkage arm and corresponding mounting plate 42, the right hand side arrangement of linkage arm 40 and anti-tip leg 50 not shown in Figure 3 is essentially a mirror image of the illustrated left side.

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An anti-tip leg 50 is suspended from the rear end 41 of each linkage arm 40 in generally vertical position and approximately parallel to the rear leg 16 of the wheelchair frame by a pivotal connection 52 between the upper end of the leg 50 and the rear end 41 of linkage arm 40. The lower portion of leg 50 slides through a guide ring portion 54 of leg holder 56, which is a tubular sleeve fitted onto the rear end of bottom tube 22 of the  
30 wheelchair frame, and is fastened in place by a set screw 58. A rubber tip 60 may be fitted onto the bottom end of the leg 50. The leg 50 is biased upwardly towards a retracted position by coil spring 62 compressed between guide ring 54 and a washer 64 fixed on leg 50.

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Fig. 3 shows part of a detent arm 66 which has a rear end 68 pivotably attached to vertical post 36 of the backrest by a retractable pin 70. Turning to Figure 4, a detent plate 74 is mounted along the underside of armrest tube 18 and has a horizontal slot 76 with a number of detent notches 78 open to the slot 76, and detent arm 66 has a forward end 72 captive for movement within slot 76.

Figure 5 shows how the detent arm 66 is retained to the plate 74. As seen in Figure 5, detent plate 74 is a side wall of a detent tube 80 of rectangular cross section. A pin 82 is secured to detent arm 66 as by welding at 84, and carries a spacer ring 86 and a retaining disc 88. The disc 88 has a disc diameter greater than the width of slot 76 except at an enlarged end opening 92 provided at the forward end of slot 76. The enlarged opening 92 admits the retaining disc 88 into the detent tube 80 and permits engagement of the pin 82 for sliding displacement along slot 76. The diameter of pin 82 within slot 76 is admitted into any one of detent notches 78 so as to detain the forward end 72 of arm 66 at a selected detent notch 78 against displacement along slot 76. A detent spring 94 is stretched between pin 82 and anchor hole 96 in the detent tube 80 and applies a spring bias urging detent arm 66 to a forwardmost position within slot 76 corresponding to a fully upright position of backrest 30.

A handgrip 90 is fastened as by welding at 98 to arm 66. The handgrip may be a short cylindrical section closed at its free end by cap 102.

Figure 6 shows how the backrest 32 is supported on linkage arm 40 for pivotal movement relative to the wheelchair frame 12. A mounting tab 100 extends from each end of the cross rail 38, as best seen in Figure 3, and is received in slot 48 of linkage arm 40. The linkage arm 40 is mounted on pivot pin 102 to mounting plate 44. The linkage arm 40 pivots in a vertical plane relative to wheelchair frame 12 as indicated by arrow A in Figure 3, thereby causing backrest 32 to pivot between an upright position illustrated in Figure 1 and a reclined position shown in Figure 2, as suggested by arrow B in Figure 3 and arrow C in Figures 2 and 3. Pivotal movement of the linkage arm 40 also moves the anti tip leg 50 up and down as suggested by arrow D in Figures 2 and 3 between an elevated or retracted position of the leg 50 shown in Figure 1 and a ground contacting extended position seen in Figure 2. The length of leg 50 is such that in the retracted position of Figure 1, the tip 60 is retracted to a position within the envelope of rear wheel 26 such that the tip of the leg does

not interfere with displacement of the wheelchair, for example, while descending a step. In Figure 2, the tip 60 rests upon a ground surface G under rear wheel 26 and makes contact with ground surface G at a location behind the rear wheel axis 28 so as to provide support against rearward tipping of wheelchair 10 which might result from loading of the reclined seat back 32.

A lockdown screw 104 is threaded in linkage arm 40 transversely to tab 100 and can be manually turned into an advanced position for closing the receiving slot 48 so as to capture tab 100 and secure the backrest 32 to the linkage arm 40. In the case where the wheelchair has a folding frame 12 the frame can be folded after removing the backrest 30. The screw 104 when retracted as in Figure 6 frees the tab 100 for withdrawal from slot 48 as suggested by arrow E, and pins 70 are withdrawn to free the backrest from detent arms 66. Folding of the wheelchair frame 12 does not require removal of the linkage arm 40 or the anti-tip leg 50 on each side of the wheelchair frame. Also, the detent arm 66 may be left dangling from its captive forward end 72 or removed from the detent plate 74 through opening 92.

The leg spring 62, in biasing the leg 50 towards its elevated, retracted position also operates to urge linkage arm 40 to an elevated position corresponding to an upright position of the backrest 30. In this manner, leg spring 62 cooperates with detent spring 94 to return the backrest 30 to an upright position, the detent arm 66 to a forwardmost position, and the legs 50 to a retracted condition.

A person sitting in wheelchair 10 can operate the reclining backrest 30 by grasping the handles 90 under each arm rest 15 of the wheelchair, lifting the handles slightly to free the detent pin 82 from detent notches 78, and pushing against the seat back 32 sufficiently to overcome the bias of springs 94, 62 until the backrest is angled to a desired reclining position, and then lowering the detent pin 82 into a detent notch 78 most closely corresponding to the desired angle of backrest 32. Elevation of the seat back is accomplished by freeing the detent arms from the detent notches 78 and allowing the springs 94, 62 to raise the backrest 30 to its upright position of Figure 1.

The reclining backrest with anti-tip protection of this invention can be retrofitted onto existing wheelchair frames without permanent modification to the wheelchair. The detent tube 80 can be attached to arm rest tube 88 of an existing wheelchair frame using screws normally provided through armrest tube 88 for fastening the armrest pad 15 to tube 18. Such  
5 screws have screw heads underneath tube 18 and thread upwardly into the bottom of the armrest pad 15. The detent tube 80 can be provided with screw holes (not shown) in its upper side 81 and aligned openings (not shown) in its bottom side 82 so as to allow insertion of a screwdriver into tube 80 for tightening of screws through side 81 and through armrest tube 18 into armrest pad 15. The mounting plate 44 may be one of a pair of such plates  
10 parallel to each other and tightened by means of bolts 45 so as to capture between them the T-joint of frame tubes 16 and 20.

While a particular embodiment of the invention has been described and illustrated for purposes of clarity and example, many changes, substitutions and modifications to the  
15 described embodiment will be apparent to those having only ordinary skill in the art without thereby departing from the scope of this invention, which is defined by the following claims.

What is claimed as new is: